S
543
S8A4
no. 1-8

BULLETIN No. 1.

UC-NRLF
B 3 099 568

BRASSICA CROSSES.

By

ARTHUR W. SUTTON, F.L.S., V.M.H.

A Lecture Delivered
Before the Linnean Society,
January 16th, 1908.

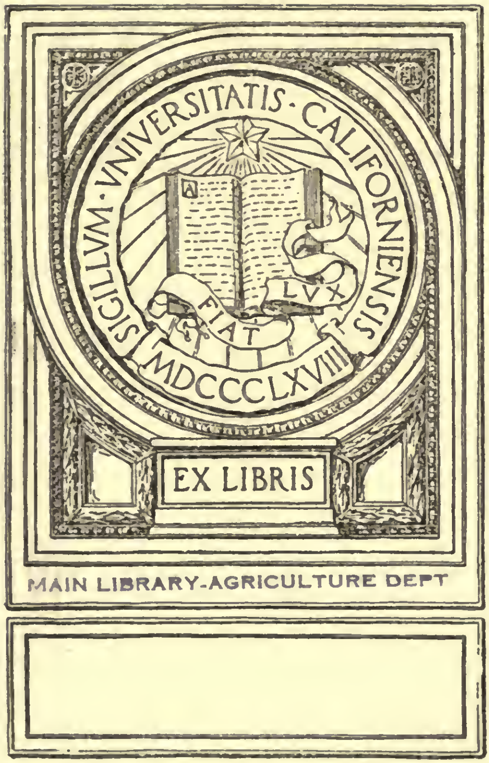
PRICE 2s. 6d. Net.

Published by

SUTTON & SONS, READING,

Seedsmen By Appointment to His Majesty King George V.

YD 04789



EX LIBRIS

MAIN LIBRARY-AGRICULTURE DEPT

EXPERIMENTS WITH HUMOGEN

IN COMPARISON WITH OTHER FERTILISERS.

A Report of the Tests
carried out at Reading in 1916

BY

MARTIN H. F. SUTTON, F.L.S.

Experiments with Humogen

BY

MARTIN H. F. SUTTON, F.L.S.

The widespread interest aroused by the reports which from time to time appeared in the press on the possible use of bacterised peat as a fertiliser, suggested to me that a comprehensive series of tests with this preparation, in comparison with other fertilisers, would prove of some service to agriculturists and horticulturists.

Through the courtesy of Professor Bottomley a supply of Humogen (or bacterised peat), as manufactured for him at Manchester, was placed at my disposal for the purpose. I have also to acknowledge the help given me by his assistant, Mr. Machen, with whom the details of the scheme were arranged, and who was good enough to make periodical visits to Reading while the experiments were in progress.

Although it was originally intended to carry out only one series of pot tests, circumstances which were not foreseen at the time arose, making a second set of trials appear necessary, and these were subsequently undertaken.

The first series consisted of experiments with Dwarf French Beans, Potatoes, and Red Clover, and was commenced on May 20th. On examining the pots shortly after this date, however, Mr. Machen expressed the opinion that the soil (ordinary potting soil) contained too much humus to permit of the Humogen giving satisfactory results. He further explained that Humogen could only be employed to advantage on poor soils, deficient in organic material. This is a point to which, it appears to me, it is desirable to call the attention of those who may contemplate using this fertiliser when placed upon the market for commercial purposes.

In view of Mr. Machen's statement I had the original series destroyed, and commenced again, using on this occasion poor soil taken from a newly broken-up piece of ground which had received no manure for some years. Details of these tests, referred to as Series I, are given on pages 4 to 8. As the trials developed, it became clear that in every instance where a dressing of Humogen had been given, growth was seriously affected. The plants presented a stunted and scorched appearance, this condition being accentuated in proportion to the increased amount of Humogen employed. Yet in the Controls, and in all other sections where Humogen had not been incorporated with the soil, the plants were perfectly healthy throughout the entire period of growth.

On calling Mr. Machen's attention to this circumstance he stated that, in his opinion, some inhibiting factor was present which at the time it was not possible to explain. Subsequently Professor Bottomley informed me he had found that the Humogen manufactured at Manchester was proving unsatisfactory, apparently owing to some toxic action being produced during the process, but that by adding a certain ingredient he believed this action could be neutralised. At his urgent request therefore I agreed on August 22 to commence an entirely new series of pot experiments, including trials with Manchester-manufactured Humogen treated with the necessary corrective.

For these later tests (see Series II, pages 9 to 12) Mustard, Italian Rye Grass, and Dwarf French Beans were grown, as the season was too far advanced to hope for satisfactory results with the same subjects as used in Series I. From the table printed on page 9 it will be seen that the experiments constituting Series II were even more comprehensive in character than those in Series I, and it was therefore the more disappointing that in the later trials no greater success attended the use of Humogen as manufactured at Manchester, although subjected to the special treatment referred to, than in Series I. On the other hand, certain sections of Series II which were dressed with Humogen prepared at Professor Bottomley's laboratory at Greenford, gave far better results than the Manchester Humogen, and were second only in merit to those dressed with a complete fertiliser.

So far as the results of these tests show, it would appear that however satisfactory Humogen may be when prepared in the laboratory, some difficulty as yet exists in manufacturing this fertiliser efficiently on a commercial scale. The question also arises whether, when standardised, it can be placed on the market in a sufficiently concentrated form and at a price low enough to bring it within the reach of large users of fertilisers. It may not be without interest to mention here that the reports of outdoor experiments recently published by the West of Scotland Agricultural Society, the Wisley Horticultural Research Station, and others, indicate results which are almost entirely unfavourable to the employment of Humogen, as then supplied, as an equivalent for farmyard manure.

Since the above notes were written, I have had the opportunity of reading Dr. Russell's report of the Humogen experiments carried out under his superintendence at Rothamsted during the summer of 1916. I regret to see that only negative results (which appeared probable when, by Dr. Russell's courtesy, I inspected the trials) were obtained. These, however, confirm my own conclusions.

SERIES I.

Two pots each of Dwarf French Beans, Potatoes, and Red Clover were grown in each of the 14 sections described below—a total of 84 pots.

General view of the Trials in Series I.

The following table shows the composition of the potting material used in the various sections.

1 Control—Plain soil.

Added to soil.

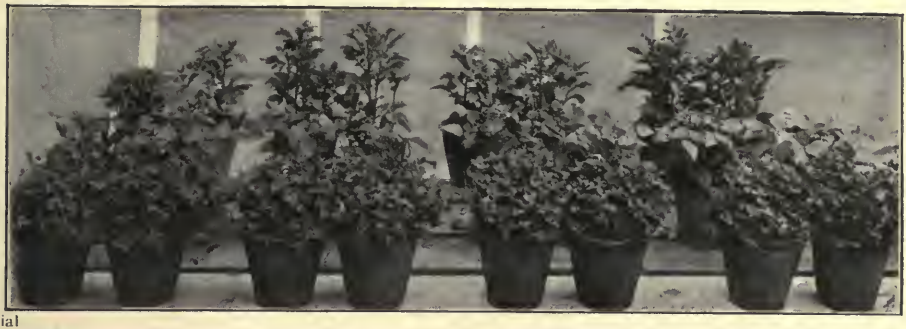
2 Complete Fertiliser (2 ozs. per pot)
3 Farmyard Manure 10%.
4 Farmyard Manure 20%.
5 Farmyard Manure 10%, and Complete Fertiliser (1 oz. per pot).
6 Humogen 5%.
7 Humogen 10%.
8 Humogen 20%.
9 Humogen 30%.
10 Humogen 5%, and Farmyard Manure 10%.
11 Humogen 10%, and Complete Fertiliser (1 oz. per pot).
12 Common Burning Peat 20%.
13 Rito 10%.
14 Rito 20%.

Pots of the 10-inch size were used, and the manures and other dressings were incorporated with the soil before sowing or planting. A plentiful supply of water was given, as required.

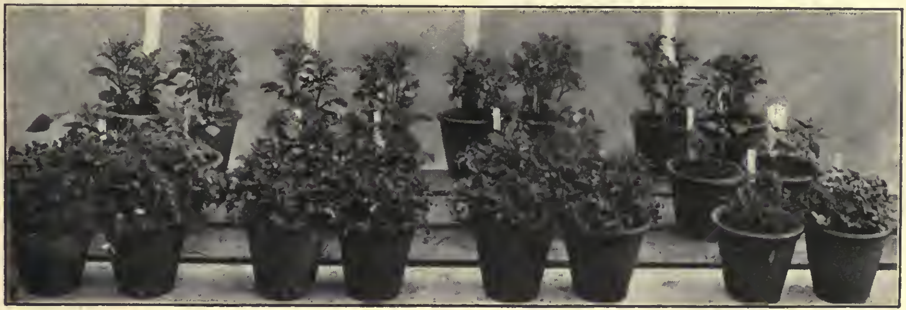
In the trials with Humogen, the plants gave the appearance of being scorched and were stunted in growth (see sections 6 to 9 in the centre of the illustration above). This feature may be still more clearly seen in the photographs of the several sections, reproduced on the following page.

The tabulated results, and some observations recorded during the growing period, are given on pages 6 to 8.

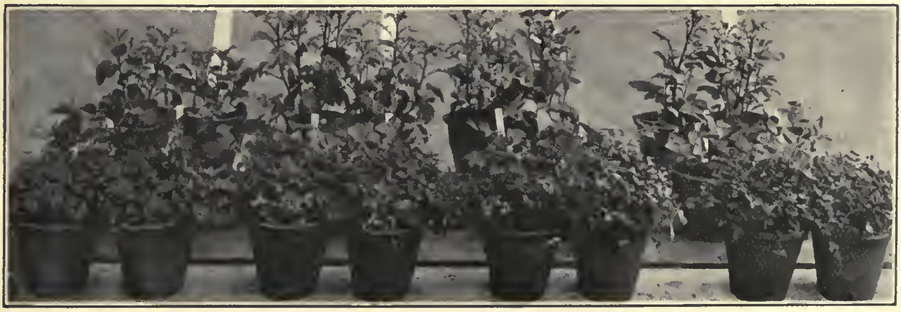
SERIES I—continued.



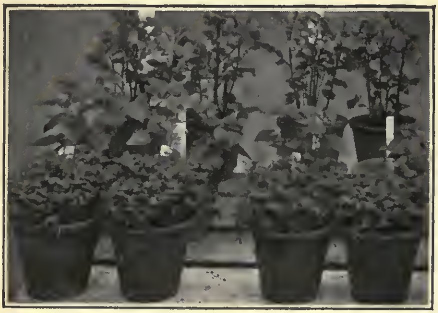
Trial Number. 1 2 3 4



Trial Number. 5 6 7 8



Trial Number. 9 10 11 12



Trial Number. 13 14

The accompanying illustrations show the comparative growth of each section, and the numbers will facilitate reference to the table of dressings printed on the preceding page.

All the photographs were taken on the same date.

For weights of the produce, see pages 6 to 8.

SERIES I—continued.

TESTS WITH DWARF FRENCH BEANS.

The seeds were sown on June 9, eight beans per pot, the plants being eventually reduced to three in a pot. The weights of the produce obtained are recorded in the following table.

Order of merit.	Dressing applied.	Weight of produce.
		ozs.
1	Farmyard Manure 20%	$9\frac{1}{2}$
2	Complete Fertiliser	$8\frac{1}{8}$
3	Farmyard Manure 10% and Complete Fertiliser	$6\frac{7}{16}$
4	Farmyard Manure 10%	$5\frac{13}{16}$
	Common Burning Peat 20%	$5\frac{13}{16}$
5	Humogen 5% and Farmyard Manure 10%	$5\frac{11}{16}$
6	Control—plain soil	$5\frac{1}{4}$
7	Humogen 10% and Complete Fertiliser	$4\frac{1}{4}$
8	Humogen 5%	$4\frac{1}{16}$
9	Humogen 10%	$3\frac{15}{16}$
10	Rito 10%	$2\frac{13}{16}$
11	Rito 20%	$2\frac{3}{4}$
12	Humogen 20%	$2\frac{7}{16}$
13	Humogen 30%	$1\frac{1}{16}$

OBSERVATIONS RECORDED DURING GROWTH.

June 28. The seedlings had appeared in all cases except Humogen (30%). All sections dressed with Farmyard Manure and the remainder of the Humogen series were the most forward. Growth seemed retarded in the Complete Fertiliser test. The Rito sections were very backward.

July 24. Farmyard manure (20% and 10%), Farmyard Manure with Complete Fertiliser, and Common Burning Peat were equal in merit, and were decidedly superior to either of the Humogen trials, of which the 5% dressing showed the best. Humogen with Complete Fertiliser was much inferior to Farmyard Manure with Complete Fertiliser. Humogen (30%) and Rito (20%) were quite the worst of the series.

August 7. All plants in flower. In the Humogen series and in the plain soil Control, the colour of the foliage was extremely poor as compared with sections dressed with Farmyard Manure, Rito, and Complete Fertiliser, the last two being particularly dark.

August 19. The superiority of the Farmyard Manure series and Complete Fertiliser series was still maintained. The only trial containing Humogen to show promise was Humogen (5%) with Farmyard Manure (10%), but this was not so good as Farmyard Manure with Complete Fertiliser. The plants in pots containing the smallest percentage of Humogen were better than those dressed with a larger quantity.

August 24 to September 11. During this period the beans were picked. The pods gathered from the Humogen sections were strikingly stunted and yellow in colour.

SERIES I—continued.

TESTS WITH POTATOES.

Planted June 10, one tuber per pot. The weight of the produce in each case is given in the table below.

Order of merit.	Dressing applied.	Weight of produce.
		ozs.
1	Farmyard Manure 20%	16
2	Humogen 5% and Farmyard Manure 10%	15
3	Farmyard Manure 10%	14¼
4	Humogen 5%	12
	Humogen 10%	12
5	Humogen 20%	11¾
6	Common Burning Peat 20%	11½
	Farmyard Manure 10% and Complete Fertiliser	11½
7	Humogen 10% and Complete Fertiliser	11
8	Complete Fertiliser	10½
9	Control—plain soil	10¼
10	Rito 10%	9¾
11	Rito 20%	5¾
12	Humogen 30%	5

OBSERVATIONS RECORDED DURING GROWTH.

July 10. All the plants had appeared, except trials dressed with Humogen (30%), Humogen with Complete Fertiliser, and Rito (20%). The Farmyard Manure with Complete Fertiliser, Complete Fertiliser alone, and the plain soil Control were strongest in growth. Between the remainder there was little difference to be seen.

July 24. The Humogen series appeared very stunted and yellow, the test containing 30% being the worst in this respect. At this date the two leading sets were those dressed with Farmyard Manure.

August 7. As regards growth of top, Complete Fertiliser alone, Farmyard Manure with Complete Fertiliser, and Rito (10%), were the best sections. Each showed up prominently, with excellent dark foliage. The Farmyard Manure sets were not so tall as the foregoing but the haulm was very sturdy. All the Humogen trials, Common Burning Peat, and the plain soil Control were distinctly inferior, both in height and colour of foliage.

September 24. The tests with Complete Fertiliser and Rito were the tallest, but the plants were somewhat drawn. Although not so tall and bushy, the Farmyard Manure sections were more sturdy in growth. The Humogen series and the plain soil Control produced less foliage than any of the other sets, and this was very poor in colour.

October 4. On this date the tubers were lifted and weighed.

SERIES I—continued.

TESTS WITH RED CLOVER.

Seed sown June 9. In each case the weight of the plants when cut on September 14 is given in the following table.

Order of merit.	Dressing applied.	Weight of produce. lb.	ozs.
1	Farmyard Manure 20%	1	2
	Farmyard Manure 10%	1	2
	Complete Fertiliser	1	2
	Humogen 5% and Farmyard Manure 10%	1	2
	Humogen 5%	1	2
2	Control—plain soil	1	1
	Common Burning Peat 20%	1	1
	Farmyard Manure 10% and Complete Fertiliser	1	1
3	Humogen 20%	1	0
	Humogen 10% and Complete Fertiliser	1	0
4	Humogen 10%		15
5	Rito 10%		13
6	Rito 20%		11
7	Humogen 30%		9

OBSERVATIONS RECORDED DURING GROWTH.

June 19. On the seedlings appearing, no difference was discernible between the various sets, with the exception of the Rito tests which were very thin and backward in growth.

July 8. In those instances where Complete Fertiliser and Rito had been used, the plants were noticeably backward as compared with the plain soil Control, Farmyard Manure, Humogen, and Common Burning Peat tests.

July 24. The Complete Fertiliser trials were now rapidly improving and appeared to be recovering from the apparent check sustained in the first stage of growth. Humogen test (30%) was extremely poor, being thin, stunted, and yellow in colour; sets dressed with Humogen (5%) showed a decided superiority over those dressed respectively with 20% and 10% of this fertiliser.

August 6. With the exception of the Humogen test (30%), which had not in any way improved, there was no great difference to be seen in any of the trials. The plain soil Control was certainly as good as the others.

September 14. The plants were cut and weighed.

SERIES II.

These tests, undertaken at Professor Bottomley's special request, were on a more extensive scale than Series I, as will be seen from the table printed below. Mustard, Italian Rye Grass, and Dwarf French Beans were the subjects grown, two pots of each per section, the seeds being sown on August 22. The pots were of the same size as for Series I, and similar soil was used.

General view of the Trials in Series II.

DETAILS OF THE DRESSINGS USED.

A Control—plain soil.

B Farmyard Manure, 10%.

C Complete Fertiliser—2 ozs. per pot.

D Bone Meal, supplied by Professor Bottomley: $1\frac{1}{3}$ oz. per pot—the same ratio as added to the Humogen and Peat tests.

E Humogen in $2\frac{1}{2}$% dressings.
  1. Manchester Humogen received in August, 1916, to which Professor Bottomley added 4% Bone Meal.
  2. Greenford Humogen, with 4% Bone Meal added by Professor Bottomley.
  3. Manchester Humogen, received in Spring, 1916, with 4% Bone Meal (Bottomley's) added at Reading.
  4. Manchester Humogen, received in Spring, 1916. No additional dressing.

F Humogen in 5% dressings.
  1. Prepared as E1.
  2. ,, ,, E2.
  3. ,, ,, E3.
  4. ,, ,, E4.

G Humogen in 10% dressings.
  1. Prepared as E1.
  2. ,, ,, E2.
  3. ,, ,, E3.
  4. ,, ,, E4.

H Common Burning Peat, 5%.

I Common Burning Peat, 5%, with 4% Bone Meal (Bottomley's) added.

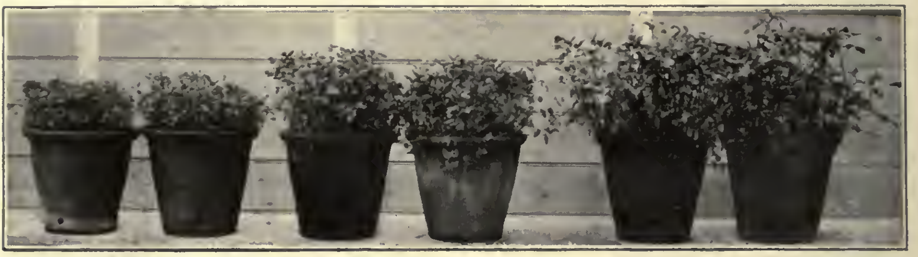
K Original Air-dried Peat, 5% (unbacterised material as used by Professor Bottomley).

L Original Air-dried Peat, 5% (unbacterised) with 4% Bone Meal (Bottomley's) added.

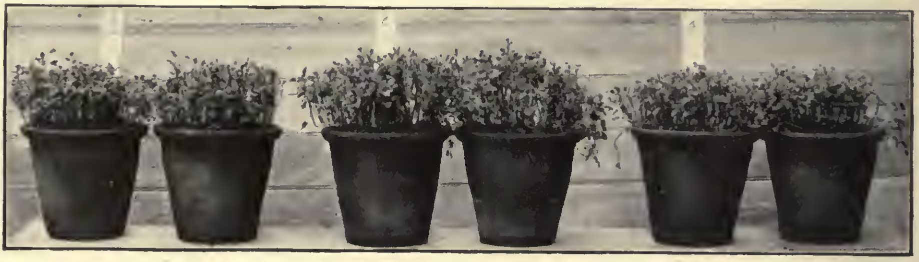
Photographs of some of the trials with Mustard and Italian Rye Grass are reproduced on pages 10 *and* 11.

SERIES II—continued.

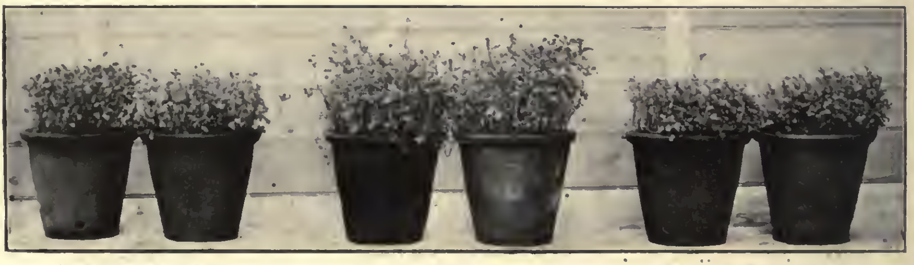
Illustrations of some of the tests with Mustard. All the photographs were taken on the same date. A complete table of the tests is given on page 9.



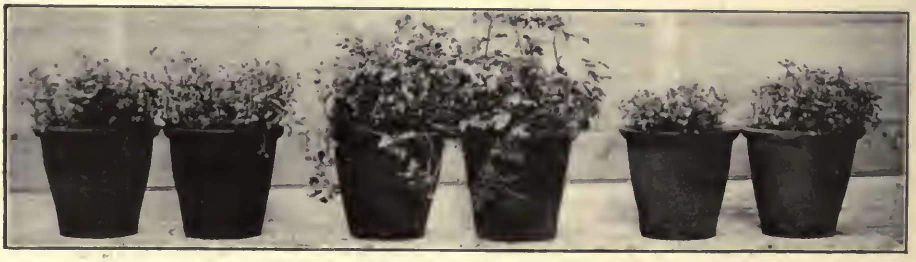
DRESSING APPLIED. { Control—Plain Soil. Farmyard Manure. Complete Fertiliser.



DRESSING APPLIED. { Rectified Manchester Humogen (2½ %) and Bone Meal. Greenford Humogen (2½ %) and Bone Meal. Manchester Humogen, original supply (2½ %).



DRESSING APPLIED. { Rectified Manchester Humogen (5 %) and Bone Meal. Greenford Humogen (5 %) and Bone Meal. Manchester Humogen, original supply (5 %).

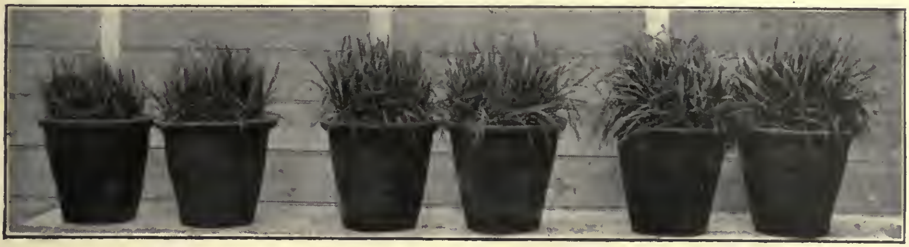


DRESSING APPLIED. { Rectified Manchester Humogen (10 %) and Bone Meal. Greenford Humogen (10 %) and Bone Meal. Manchester Humogen, original supply (10 %).

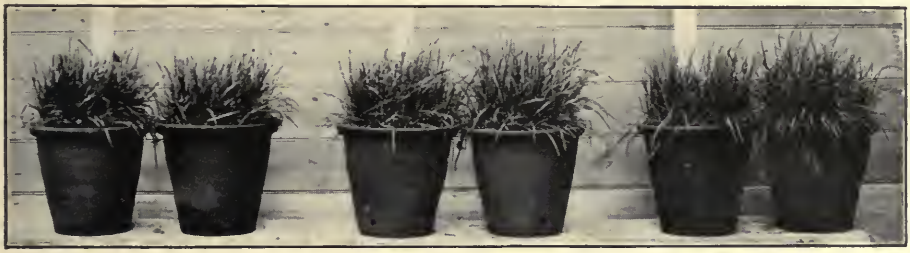
For Notes on growth, see page 12.

SERIES II—continued.

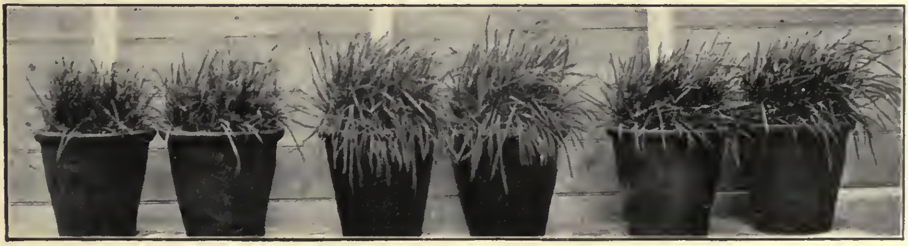
Illustrations of some of the tests with Italian Rye Grass. All the photographs were taken on the same date. A complete table of the tests is given on page 9.



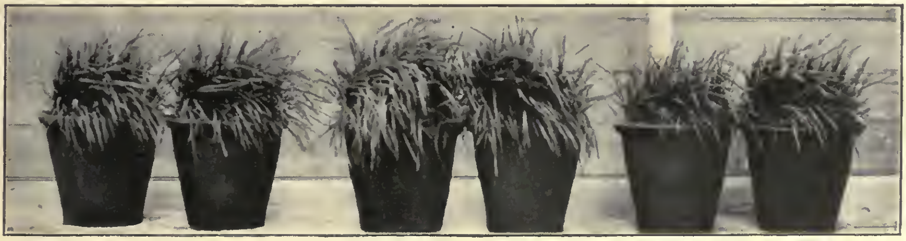
DRESSING APPLIED. { Control—Plain Soil. | Farmyard Manure. | Complete Fertiliser.



DRESSING APPLIED. { Rectified Manchester Humogen (2½ °/o) and Bone Meal. | Greenford Humogen (2½ °/o) and Bone Meal. | Manchester Humogen, original supply (2½ °/o).



DRESSING APPLIED. { Rectified Manchester Humogen (5 °/o) and Bone Meal. | Greenford Humogen (5 °/o) and Bone Meal. | Manchester Humogen, original supply (5 °/o).



DRESSING APPLIED. { Rectified Manchester Humogen (10 °/o) and Bone Meal. | Greenford Humogen (10 °/o) and Bone Meal. | Manchester Humogen original supply (10 °/o).

For Notes on growth, see page 12.

SERIES II—continued.

Tests with Mustard, Italian Rye Grass, and Dwarf French Beans, sown August 22—*continued.*

OBSERVATIONS RECORDED DURING GROWTH.

MUSTARD.

From the commencement of growth the Complete Fertiliser and Greenford Humogen (10%) sections were quite the most promising, for both colour and amount of foliage, and this superiority was maintained until mid-October, when the low night temperature rendered further notes unavailing. At the last named period the order of merit was as follows :—

1 { Complete Fertiliser.
Greenford Humogen, 10%.

2 { Farmyard Manure.
Bone Meal (Bottomley's).
Greenford Humogen 5%, with Bone Meal.

3 { Greenford Humogen 2½%, with Bone Meal.
Manchester Humogen (new) 10%, with Bone Meal.

4 { Manchester Humogen (original) 2½%, with Bone Meal.
Manchester Humogen (original) 5%, with Bone Meal.
Manchester Humogen (original) 10%, with Bone Meal.
Manchester Humogen (new) 2½%, with Bone Meal.
Manchester Humogen (new) 5%, with Bone Meal.

There was no perceptible difference to record in the condition of the remaining sections.

The addition of Bone Meal to the Manchester Humogen (original supply) brought about but very little improvement. There was also no advantage to be seen in the Manchester Humogen (new supply) with Bone Meal over the original material with Bone Meal.

ITALIAN RYE GRASS.

There was little to choose between the various sets until September 11, when the trials with Complete Fertiliser and Greenford Humogen (10%) made noticeable progress. By September 18 these two sections held a striking lead over all others for height of plant and colour of foliage, and this advantage was maintained until the recording of notes ceased in mid-October. The final order was precisely the same as in the tests with Mustard given above.

DWARF FRENCH BEANS.

The small amount of foliage that was produced, owing to the advanced season of the year, gave evidence that the trials dressed with Greenford Humogen were far superior to those grown with the Manchester article. The latest notes taken, however, showed that the Farmyard Manure section was practically equal to the Greenford Humogen.

From a review of the general results obtained in Series II it will be seen that the hope which Professor Bottomley entertained with regard to the rectified Manchester-manufactured Humogen (see page 3) was unfortunately not realised.

The Humogen prepared at his laboratory at Greenford, a supply of which he also kindly sent me, gave better results, but it is presumably not possible for material so prepared to be available in sufficient quantities for general use.

The photographs reproduced in this Bulletin are strictly copyright.

UNIVERSITY OF CALIFORNIA LIBRARY
BERKELEY

Return to desk from which borrowed.
This book is DUE on the last date stamped below.

21Apr'49TJ

LIBRARY USE
MAR 31 1952

31Mar52

JUL 12 1971 1 1

REC'D LD AUG 5 71 -11 AM 72

JUN 2 1987

LD 21-100m-9,'48(B399s16)476

YD 04789

GENERAL LIBRARY - U.C. BERKELEY
B000878100

455749
S543
S8A4
no.1-8
UNIVERSITY OF CALIFORNIA LIBRARY

W. H. SMITH & SON,
Printers,
55 Fetter Lane,
London, E C